Milford Haven Pipelines

Review of Proposed Felindre to Tirley 48” Gas Pipeline

Ofgem

Penspen Limited
3 Water Lane
Richmond upon Thames
Surrey
TW9 1TJ
United Kingdom

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Contents

REVISION AND AUTHORISATION RECORD

Rev	Date	Description	By	Chkd	PM
0	20/09/05	Issued for Approval	RH	JM	JM
1	26/09/05	Client Comments Incorporated	RH	JM	JM
2	3/11/05	Revised to Incorporate Peterstow to Tirley Section	RH	JM	JM
3	18/11/05	Revised to Incorporate Ofgem's Comments	RH	JM	JM

1. Executive Summary

Penspen has been requested by Ofgem to review the investment and schedule needed to deliver 650 GWh/day of NTS entry capacity at Milford Haven.

Penspen has considered the Nacap Lawrence report "Route Corridor Investigation Study, South Wales and the West Reinforcement Project, document No. RT-0064/BD/PMS" dated July 2005 and National Grid Gas Transmission report on the Peterstow to Tirley Route Investigation Study dated June 2005 issued by National Grid Gas Transmission for the Milford Haven Gas Pipeline Project. A detailed review is required in respect to the preferred route, Corridor 13 with a route length of approx. 148.5km and corridor A1/A2/A4 with a route length of approx. 29.7km, in relation to the Constructability, Schedule and Cost Estimate. Both pipeline routes equate to a total of 178.2km and the combined route is known as the Felindre to Tirley pipeline route.

The review included a detailed site visit of the recommended route (Corridor N^{o} 13) which took place in the week commencing 30th August 2005, for 4 days and a site visit of the recommended A1/A2/A4 corridor commencing on the 1st of November 2005 for 2 days.

Taking into consideration the alternative DTI construction authorization dates (namely June 2006, September 2006, December 2006, March 2007) and the realistic number of contracts or spreads discussed in this report then it is Penspen's view that the following construction dates could be met, under typical conditions experienced on pipeline projects.

- **2 Spread Option start no later than April 2007**

  Assuming the decision to award 2 contracts or spreads then it is Penspen's view that commissioning of first gas would be most likely completed by early 4th Qtr 2008 (ie October 2008) for all the DTI Construction Authorisation dates given.

- **3 Spread Option start no later than June 2006**

  Assuming the decision to award 3 contracts or spreads with the DTI Construction Authorisation granted in June 2006 then it is Penspen's view that the pipeline will most likely be commissioned 4th Qtr 2007 (ie November 2007).

- **3 Spread Option start no later than April 2007**

  Assuming the decision to award 3 contracts or spreads with DTI Construction Authorisation granted in September 2006, December 2006 or March 2007 then it is Penspen's view that the pipeline will most likely be commissioned by early 4th Qtr 2008 (ie October 2008).

- **4 Spread Option start no later than June 2006**

  Assuming the decision to award 4 contracts or spreads with DTI Construction Authorisation granted in June 2006 then it is Penspen's view that the pipeline will most likely be commissioned by October 2007.

- **4 Spread Option start no later than April 2007**

  Assuming the decision to award 4 contracts or spreads, irrespective of DTI Construction Authorisation date then it is Penspen's view that the pipeline will most likely to be commissioned by December 2007 with some reinstatement carried over to 2008.

- **5 Spread Option start no later than April 2007**

  Assuming the decision to award 5 contracts or spreads irrespective of DTI construction authorization date it is Penspen's view that the pipeline will most likely be commissioned by November 2007.

- **6 Spread Option start no later than April 2007**

  Assuming the decision to award 6 contracts or spreads irrespective of DTi Construction Authorisation date it is Penspen's view that the pipeline will most likely be commissioned by October 2007.

The following construction date could be met if planning and environmental conditions were worse than typical.

- **6 Spread Option (the more cautious approach) start no later than April 2007**

  Assuming the decision to award 6 contracts or spreads, irrespective of DTI Construction Authorisation date it is Penspen's view that the pipeline will most likely be commissioned by December 2007.

The Cost Estimate shown on Table 1 in this Report was developed using in-house data and discussions with Contractors and suppliers.

The Base Case in this study is the assumption that one Contractor is appointed who under normal pipeline techniques would construct this pipeline in 2 spreads over two seasons.

In the event the Construction Authorisation should be granted later than the specified June 2006 date say August 2006 then at an increased cost some works could be undertaken in 2006 to improve the achievement of the completion date.

Assuming that all schedule criteria is met as stipulated in Section 5.1 then it is Penspen's view that the pipeline could also be commissioned in October 2007 in the scenario of at least 4 spreads starting April 2007. However, in reality we feel that achieving all the criteria in Section 5.1 is very unlikely, and therefore, to be certain and secure the Scenario utilizing 6 spreads starting in April 2007 to commission by 4th Qtr 2007 should only be considered.

Table 1: Cost Estimates

Item	Case	Cost Estimate - Material, Land Management, Project Costs, Design Phase	Cost Estimate Construction Pipeline AGIs, Project Costs	Percentage Increased from Base Case, Construction	Cost of Increase over Base Case	Total Cost including increase over Base Case	Plus 20% Contingency	Total Cost of Case
1.	Base Case 1 Contractor with 2 spreads	128,000,000	122,250,000	-	-	250,250,000	50,050,000	300,300,000
2.	1 Contractor with 3 spreads	128,000,000	122,250,000	5%	6,112,500	256,362,500	51,272,500	307,635,000
3.	2 Contractors with 2 spreads	128,000,000	122,250,000	10%	12,225,000	262,475,000	52,495,000	314,970,000
4.	2 Contractors with 3 spreads	128,000,000	122,250,000	15%	18,337,500	268,587,500	53,717,500	322,305,000
5.	2 Contractors with 4 spreads	128,000,000	122,250,000	20%	24,450,000	274,700,000	54,940,000	329,640,000
6.	3 Contractors with 3 spreads	128,000,000	122,250,000	20%	24,450,000	274,700,000	54,940,000	329,640,000
7.	3 Contractors with 4 spreads	128,000,000	122,250,000	25%	30,562,500	280,812,500	56,162,500	336,975,000
8.	3 Contractors with 5 spreads	128,000,000	122,250,000	30%	36,675,000	286,925,000	57,385,000	344,310,000
9.	2 Contractors with 6 spreads	128,000,000	122,250,000	30%	36,675,000	286,925,000	57,385,000	344,310,000
10.	3 Contractors with 6 spreads	128,000,000	122,250,000	35%	42,787,500	293,037,500	58,607,500	351,645,000

The Base Case Cost Estimate for the Felindre to Tirley 48” Gas Pipeline is included in Appendix A.

The Base Case in this study is the assumption that one Contractor is appointed who under normal pipeline techniques would construct this pipeline in 2 spreads over two seasons.

2. Introduction

Penspen has been requested by Ofgem to review the investment and schedule needed to deliver 650 GWh/day of NTS entry capacity at Milford Haven.

Penspen has considered the Nacap Lawrence report "Route Corridor Investigation Study, South Wales and the West Reinforcement Project, document No. RT-0064/BD/PMS" dated July 2005 and National Grid Transco report on the Peterstow to Tirley Route Investigation Study dated June 2005 issued by National Grid Gas Transmission for the Milford Haven Gas Pipeline Project. A detailed review is required in respect to the preferred route, Corridor 13 with a route length of approx. 148.5km and corridor A1/A2/A4 with a route length of approx. 29.7km, in relation to the Constructability, Schedule and Cost Estimate. Both pipeline routes equate to a total of 178.2km and the combined route is known as the Felindre to Tirley pipeline route. Under typical conditions experienced on pipeline projects.

This Work has been produced by Penspen for Ofgem as part of their Gas Consultancy Services Framework Agreement with Ofgem.

2.1 Project Description

National Grid Gas Transmission is currently considering several options for constructing a 48-inch diameter high pressure natural gas pipeline in the South West of Wales, to transport gas from two new Liquified Natural Gas (LNG) importation terminals in the vicinity of Milford Haven.

The planned onward route from Milford Haven is via an onshore landline eastwards towards Gloucester. However, there are a number of routing difficulties in the Aberdulais to Llanvellrine section and various alternative routes have been studied by NGT.

2.2 Objective

Ofgem (Office of Gas and Electricity Markets), has a framework agreement with Penspen for the provision of engineering services.

In this instance, Ofgem has requested Penspen to undertake a review of the onshore section Corridor 13 and corridor A1/A2/A4 and this report investigates the constructability, schedule and the cost estimate for this route which commences to the north of junction 46 of the M4 and heads North Westwards past Penllergeaer Forest and terminates in the vicinity of Tirley.

The route is shown in Appendix B.

2.3 Abbreviations

The following abbreviations are used within this document:-

AFC	Approved for Construction
DTI	Department of Trade and Industry
EIA	Environmental Impact Assessment
ES	Environmental Statement
HSE	Health and Safety Executive
ITT	Invitation to Tender
LNG	Liquified Natural Gas
NGT	National Grid Transco
Ofgem	Office of Gas and Electricity Markets
PA	Pipelines Act
PCA	Pipeline Construction Authorisation

SAC Special Area of Conservation

3. Cost Estimate

The Onshore Cost Estimate was carried out based on the information given by Ofgem which included the National Grid Gas Transmission / Nacap Lawrence Report "Route Corridor Investigation Study, South Wales and the West Reinforcement Project, document N° RT-0064/BD/PMS" dated July 2005 and National Grid Gas Transmission's Report on the Peterstow to Tirley Route Investigation Study dated June 2005.

Information was also gathered from the site visits conducted by Penspen in the period 30 August to 1 September 2005 and 1 and 2 November 2005.

The information which was extracted from these reports are as follows:

- Length of Pipeline: 178.2km (say 180.0km). This is the Penspen selected route within the corridor as opposed to the 191 km as started by National Grid Gas Transmission. Penspen have used their selected route length in the Cost Estimate.
- Diameter: 48" = 1200mm
- Crossings: 1 motorway, 19 A roads, 15 B roads, 22 tracks, 94 minor roads, 4 railways, 15 main rivers, 53 minor water courses
- Type of Ground: Generally difficult terrain, rural, which included rock, flood plain, forestry, rolling hills, hills with steep slopes and difficult working conditions in some areas due to the sensitivity of the area.

A Cost Estimate has been developed using the following elements and assumptions:

1. Discussions with reputable suppliers with up to date costs of material
2. Database unit rates for all construction activities - the rates had been taken from actual projects, tenders and other sources of information
3. Percentage additions, to calculate sums for project management, environmental assessment, design, investigations, consents, supervision etc
4. Assumed values of land costs. The values used are based on current market rates inflated to the probable timing of the payment, itself linked to the time of construction. Such items are inherently volatile and subject to many influences, any one which can have a marked effect on the overall cost of the item and in the case of land for many sections of pipelines this can significantly affect the overall project cost.
5. The estimate is based on 2005 rates.
6. The cost estimate is developed to an accuracy of ± 25%.
7. The price of steel is taken as £730 / tonne for 22.2mm wall thickness and £780 / tonne for 15.9mm wall thickness. This information has been supplied by National Grid Transco.
8. 2 number block valves and 3 no Above Ground Installations have been included with major pressure reduction installations at Peterstow and Tirley, a multi junction at Felindre and an intermediate pig trap at Brecon.

9. 20% contingency has been added to the total capital costs.

10. We have assumed that the Base Case for this cost estimate is that only one Contractor is appointed and the pipeline is constructed using traditional construction techniques and the pipeline is constructed in 2 spreads over two seasons.

11. Terrain types as explained in 4.4 were used in the Cost Estimate and construction rates adjusted accordingly.

12. We have assumed that 20% of the pipeline along the Peterstow to Tirley section will be heavy walled pipe as National Grid Gas Transmission have indicated that a significant proportion of the pipeline will be heavy wall in this section and approximate 8% for the rest of the pipeline route.

13. Based on in-house experience we have estimated percentage increased costs on the construction phase of the base case only as stated in Table 1: Cost Estimates. The reason for the increased costs is that the project would incur additional mobilization costs, increased project costs (additional sets of design/documents as opposed to 1 etc), more management, separate fabrication yards or pipe dumps, duplication of appointed subcontractors, most likely more plant will be required which will make less productive and overall less efficient.

The Base Case Cost Estimate for the Felindre to Tirley 48" Gas Pipeline (178.2 km) is included in Appendix A.

Table 1: Cost Estimates

Item	Case	Cost Estimate - Material, Land Management, Project Costs, Design Phase	Cost Estimate Construction Pipeline AGIs, Project Costs	Percentage Increased from Base Case, Construction	Cost of Increase over Base Case	Total Cost including increase over Base Case	Plus 20% Contingency	Total Cost of Case
1.	Base Case 1 Contractor with 2 spreads	128,000,000	122,250,000	-	-	250,250,000	50,050,000	300,300,000
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9.	2 Contractors with 6 spreads	128,000,000	122,250,000	30%	36,675,000	286,925,000	57,385,000	344,310,000
10.	3 Contractors with 6 spreads	128,000,000	122,250,000	35%	42,787,500	293,037,500	58,607,500	351,645,000

4. Pipeline Route

4.1 Routing Site Visit

During the period 30 August to 1 September 2005 and November 1 to 2 November 2005 the corridor defined as N^{o} 13 in the National Grid Gas Transmission report dated July 2005 and section A1, A2 and A4 as defined in the National Grid Gas Transmission Reports dated June 2005 was visited and viewed from Public Rights of Way in order to assess the constructability of the pipeline both in terms of Cost and Schedule.

The route followed is that defined in Section 7.1.5 in the July National Grid Gas Transmission report together with the attached maps (Appendix B) showing the route corridor investigation study floodplain maps N^{os} 1-11, the route corridor information study geological survey map N^{o} 1 and the route corridor investigation study environmental constraints maps N^{os} 2-11 and the corridor shown as Section A1, A2 and A4 in the National Grid Gas Transmission Report dated June 2005 and shown on the Constraints Maps Section 8.0.

4.2 Description of Pipeline Route Corridor 13 (Felindre to Peterstow)

Corridor 13 commences to the North of Junction 46 of the M4 and heads North Westwards past Penllergaer Forest and continues along the route of high voltage pylon line and a large water pipeline. It crosses the steep slopes of Cwm Dulais, and the Afon Dulais, climbing onto the high ground of Cefn Drum before falling into the wide valley of the River Loughor. It crosses a number of minor roads, the Afon Camffrwd and a railway before crossing the River Loughor. It then climbs steeply out of the valley and turns Northwards, crossing the A483 West of Tycroes. As it continues North the corridor broadens to avoid the Carmel Nature Reserve. It crosses numerous reinstated opencast coal workings and then enters topography dominated by limestone exposures before dropping into the wide valle of the Afon Towy and then back out to cross the A40.

To the North East of Rhosmaen the corridor rejoins the valley then A4069. It then heads East, entering into the Brecon Beacons National Park and passes around the Northern flank of Mynydd Myddfai. It then heads South East and broadens to avoid Waun-Ddu SSSI and follows a roman road across Mynydd Back Trecastell.

From Trescastell the corridor heads East and crosses the River Usk and generally follows the path of the A40 and the River Usk to Sennybridge and on to Aberyscir. Here the corridor turns North East, leaving the National Park to the North of Brecon. The corridor crosses the B4520 and a tributary of the River Usk as it heads North North East to Mynydd Fforest.

The corridor then heads South East across Mynydd Fforest and then North to Llyswen, crossing the A470, A479, the River Wye and the B4350. From here it continues North East, following the Northern Bank of the River Wye towards Hay-on-Wye. It crosses the A438 near Glasbury, running parallel to this road and the Wye, which meanders across the corridor. It passes to the North of Hay, turning East crossing the Wye near Pontvaen.

To the North of Hay-on-Wye the corridor heads East crossing Hardwicke Brook and the B4352 and running parallel to the B4348 towards Dorstone and turning South East into the Golden Valley which the River Dore runs through. The corridor then heads South East, to the South of Wormbridge crossing the Heads of the Valley Road (A465) and a railway line. From here the corridor heads East to Wormelow Tump, where it crosses the A466 and the B4348 and turns South East to terminate in the vicinity of Treaddow on the A4137.

Description of Pipeline Route Sections A1, A2 and A4 Peterstow to Tirley

Corridor A1, A2 and A4 start at Treadlow east of the A4137 to run North East for some 3km to the west of the River Wey South of Strangford, crossing the River Wey the route continues East just North of Crowhill and Upton Bishop crossing the A449 on route from Upton Bishop. The route continues North East past Kempley Green to the South of Dymock where the route crosses the M50 to run South East to Compton Green and then East across the River Leydon to the South of Staunton and across the A417 to the existing National Grid Gas Transmission above ground installation some 2.5kms West North West of Tirley.

4.3 Crossings along the Pipeline Route Corridor 13 Section A1, A2 and A4

Depending on the final route selected we estimate the number of crossings will be as follows:-

Motorways	1
A roads	19
B roads	15
C roads	94
Tracks	23
Railways	4
Named Rivers	15
Minor Water Courses	53

Total Pipeline Route Length 178.2 km

4.4 Type of Terrain Crossed by the Proposed Pipeline

In order to assess the constructability of the pipeline both in terms of prices and schedule 5 levels of terrain were identified, described and quantified as follows:-

Type 1 Flat or light rolling hills approximately 56.2km of the route length.

Type 2 Rolling hilly terrain approximately 42.1km of the route length, with construction progress reduced by 25% compared to terrain type 1, due to more difficult conditions.

Type 3 Hilly terrain with some steep slopes approximately 41.1km of the route length with construction progress reduced by 50% compared to terrain type 1, due to more difficult conditions.

Type 4 Hills and valleys with steep slopes approximately 6.5km of the route length with construction progress reduced by 80% compared to terrain type 1, due to more difficult conditions.

Type 5 Terrain across flood plains requiring weight coating to the pipeline approximately 32.3km of the route length, with construction progress reduced by 25% compared to terrain type 1, due to more difficult conditions.

The location of the above types of terrain are shown on the Pipeline Route maps Appendix B with photographs located on these maps and included in this Report as Appendix C.

4.5 Main Observations and Assumptions Taken During Site Visits

These are the main observations and assumptions made by Penspen following the Site Visit.

1. The site visit concluded that site conditions for pipeline construction were difficult on the western side of the route and in general were easier the further east you travelled along the pipeline route

2. As a consequence of the above the following spread lengths have been assumed in an attempt to arrive at a situation where all spreads finish on or about the same time

- If two separate contracts or spreads were to be awarded by National Grid Gas Transmission then the western spread would be approximately 80km and the eastern approximately 100km

- If three contracts or spreads were to be awarded by National Grid Gas Transmission then the western spread would be approximately 50km, the central spread 60km and the eastern spread approximately 70km

- If four contracts or spreads were to be awarded by National Grid Gas Transmission then the length of each spread from west to east should be approximately 35km, 45km, 45km and 55km

- If five contracts or spread were to be awarded by National Grid Gas Transmission then the length of each spread from West to East would be approximately 30km, 35km, 35km, 40km and 40km

- If six contracts or spreads were to be awarded by National Grid Gas Transmission then the length of each spread from West to East would be approximately 28km, 28km, 32km, 32km, 35km and 35km

5. Project Schedule

5.1 Schedule Criteria

The project schedule for a pipeline is dependent on several factors including the following:-

1. When Construction Authorisation is granted by the DTI enabling construction to commence

   This report assesses the schedule based on 4 dates for this authorisation given by Ofgem.

   a) June 2006

   b) September 2006

   c) December 2006

   d) March 2007

2. How many Contractors or Spreads are mobilised to undertake construction

   This report considers 10 options as given in Table 1 Appendix A.

3. Length of Route Allocated to Each Spread or Contractor

   Since in general the Western end of the route is relatively difficult and gets easier as you go East the report considers different lengths for each spread as follows:

   a) For 2 spreads West 80km and East 100km

   b) For 3 spreads West 50km Central 60km and East 70km

   c) For 4 spreads from West to East 35km, 45km, 45km and 55km

   d) For 5 spreads from West to East 30km, 35km, 35km, 40km and 40km

   e) For 6 spreads from West to East 28km, 28km, 32km, 32km, 35km and 35km

Penspen have not considered any contractual situation that would involve more than 6 spreads as this is considered very unlikely for a pipeline of this length because of contractual and management reasons.

A typically spread is deemed to include a complete Contractor Construction Team including various gangs which include, crossings crew, special sections crew, tie-in crews, testing crew etc.

Ideally the following would be in place to minimise the duration of the project.

4. Availability of Materials

   All materials will be available as required. This will require long delivery materials to be ordered and manufactured ahead of construction authorisation.

5. Availability of Land

All land is available at start of construction in order to avoid delays and spread moves.

6. Environmental Restrictions

   Our site visits indicated that whilst there may be some restricted working areas we cannot foresee any environmental constraints that would have a serious effect on the pipeline construction.

7. All environmental issues have been taken care of in advance including preparation of environmental studies and any necessary archaeological field work

8. Weather

   That weather conditions are as experienced over the past 3 years. Which have been dry and good for construction.

9. Working Hours

   That no restrictions on working hours on the contractor by the DTI as part of the Construction Authorisation and is 7 days/week, 10 hours per day.

10. Long lead items (pipeline, valves, bends etc) are available (ie they need to be ordered at least 12 months in advance) in a local pipe dump at the date of DTI Construction Authorisation

11. Both Skilled Manpower and Plant are available

Since Penspen do not consider all of the above criteria (i.e. items 4 to 11) will be met typically one might assume that the weather would be say average compared to the last 20 years, that some environmental restrictions will apply, that working hours are say 6 days per week and that some temporary lockouts to land will apply. On this basis the following realistic scenarios are considered achievable, on the basis that the Construction Contractor(s) is contracted to start work immediately following DTI Construction Authorisation.

5.2 Schedule for 2 Spreads with DTI Construction Authorisation Granted June 2006, September 2006, December 2006 or March 2007

We estimate that for this particular case the following typical schedule will follow if DTI consent is granted in June 2006:

- Contractor is mobilised by June 2006 or April 2007.
- Undertake construction on some special sections June 2006 to September 2006 if mobilized in June 2006.
- 1st full pipeline construction season, fence, string, trench, weld, NDT, hydrotest, backfill and part reinstate 55% of spread lengths. Start April 2007. Completed September 2007.
- 2nd full pipeline construction season fence, string, trench, weld, NDT, hydro test, backfill and reinstate remaining 45% of spread length, and construct AGIs at all locations and intermediate valve stations. Start April 2008, mechanically complete September 2008.
- Loop test and commission system start September 2008, complete October 2008.

5.3 Schedule for 3 Spreads with DTI Construction Authorisation Granted June 2006

We estimate that for this particular case the following typical schedule will follow:

- Contractor is mobilized by June 2006.
- 1st partial pipeline construction season, fence, string, trench, weld, NDT, hydro test, backfill and part reinstate 35% of spread length. Start June 2006, complete September 2006.
- 2nd full pipeline construction season, string, trench, weld, NDT, hydrotest, backfill and reinstate 65% of spread length and construct AGIs at all locations and intermediate valve stations. Start April 2007, mechanically complete September 2007.
- Loop test and commissioning system start October 2007, complete November 2007.

5.4 Schedule for 3 spreads with DTI Construction Authorisation Granted September 2006, December 2006 or March 2007

We estimate that for this particular case the following typical schedule will follow:

- Contractor is mobilised by April 2007.
- 1st full construction season, fence, string, trench, weld, NDT, test backfill and part reinstate 65% of spread length start April 2007 complete September 2007.
- 2nd full construction season fence, string, trench weld, NDT, test backfill and part reinstate 35% of spread length and construct AGI's at all locations and intermediate valve stations start April 2008 mechanically complete August 2008.
- Loop test and commission system start September 2008 complete October 2008.

5.5 Schedule for 4 Spreads with DTI Construction Authorisation Granted June 2006

We estimate that for this particular case the following typical schedule will follow:

- Contractor is mobilized by June 2006.
- 1st partial pipeline construction season, fence, string, trench, weld, NDT, hydrotest, backfill and part reinstate 40% of spread length. Start June 2006, complete September 2006.
- 2nd full construction season fence, string, trench, weld, NDT, test backfill and reinstate 60% of spread length and construct AGI's at all locations and intermediate valve stations, start April 2007 mechanically complete August 2007.
- Loop test and commissioning system start September 2007, complete October 2007.

5.6 Schedule for 4 Spreads with DTI Construction Authorisation Granted September 2006, December 2006 or March 2007

We estimate that for this particular case the following typical schedule will follow:-

- Contractor is mobilised by April 2007.

- 1st full pipeline construction season, fence, string, trench, weld, NDT, hydro test, backfill and part reinstate the whole spread and construct AGI's at all locations and intermediate valve stations. Start April 2007 mechanically complete November 2007.

- Loop test and commissioning system. Start November 2007 complete December 2007.

- Complete reinstatement over operational pipeline Spring 2008.

5.7 Schedule for 5 Spreads with DTI Construction Authorisation Granted June 2006, September 2006, December 2006 or March 2007

We estimate that for this particular case the following typical schedule will follow:-

- Contractor is mobilised by April 2007.

- 1st full pipeline construction season, fence, string, trench, weld, NDT, hydro test, backfill and part reinstate the whole spread and construct AGI's at all locations and intermediate valve stations. Start April 2007 mechanically complete September 2007.

- Loop test and commissioning system. Start October 2007 complete November 2007.

5.8 6 Spread Option Start no later than April 2007

Schedule for 6 spreads with DTi construction authorization granted September 2006, December 2006 or March 2007.

We estimate that for this particular case the following typical schedule will follow.

- Contractor is mobilised by April 2007.

- 1st full pipeline construction season, fence, string, trench, weld, NDT, hydro test, backfill and part reinstate the whole spread and construct AGI's at all locations and intermediate valve stations. Start April 2007 mechanically complete August 2007.

- Loop test and commissioning system. Start September 2007 complete October 2007.

5.9 6 Spread Option Start no later than April 2007 (the more cautious approach)

Section 5.1 identifies areas that impact on construction schedules namely:-

Availability / Access to land
Availability of material
Environmental Issues
Weather
Working Hours
Resources
Construction Authorisation Date

The schedules given in 5.2 to 5.7 inclusive are based on typical pipeline projects undertaken over the past 3 or 4 years. In view of the national importance placed on completion of this project it might be prudent to take a more cautious approach when taking the following into consideration:-

a) The route for the pipeline runs through areas of outstanding beauty and of importance to tourism and leisure.

b) The weather could be more inclement than that experienced in the last 3 or 4 years. Statistically for the summers in South West England and South Wales the rainfall as a percentage of the average for the periods 1961-1990 was:-

2002	79%
2003	85%
2004	116%
2005	89%

Average for 2002-2005 - 92.25%

c) Restricted working hours could be imposed in some areas along the route. so enforcing a 5½ day week.

d) Previously undetected sites of archaeological interest or creature habitat could be discovered during construction.

e) Environmental issues could impose large tracks with restricted working areas

f) That some compulsory rights to land are required so delaying works or requiring spreads to move around individual farms or fields.

g) An outbreak of Foot and Mouth, as experienced in 2001, or other animal related restrictions.

When taking the above into account the following schedule and contractual strategy should be considered albeit more expensive in order to better safeguard a completion date by 2007 should construction authorization not be granted by June 2006 so making the earliest start date for construction April 2007.

- Contractor is mobilized by April 2007
- 1st full pipeline construction season, fence, string, trench weld not, hydro test backfill and reinstate the whole spread and construct AGIs at all locations and intermediate valve station.
- Start April 2007 mechanically complete October 2007.
- Loop test and commissioning system start November 2007 complete December 2007.

The above schedules are irrespective of the number of Contractors appointed as for example a 3 spread pipeline project could be by one, two or three Contractors, depending on the Contractors resources and availability.

Appendix A: Cost Estimate for Felindre to Tirley 48” Gas Pipeline

COST ESTIMATE FOR Felindre to Tirely 48" Gas Pipeline

1

Total Route Length	178.2km
Pipeline Diameter	48"
Design Pressure	94 barg

No	ITEM	UNIT	QTY	RATE (£)	COST (£)
1	**MATERIALS PIPELINE**				
1.1	Supply 48" 15.9mm 5LX80 linepipe delivered to pipe dump	metre	160,200	367	58,793,400
1.2	Supply 48" 22.2mm 5LX 80 linepipe delivered to pipe dump	metre	18,000	478	8,604,000
1.3	Supply 3D/5D bends 48"	no.	200	15,000	3,000,000
1.4	Concrete weight coating on 48" pipe	metre	32,300	250	8,075,000
1.5	3 layer polyethylene coating on pipe	metre	178,200	60	10,692,000
				SUB TOTAL £	89,164,400
2	**LAND COSTS**				
2.1	Wayleave and compensation	metre	178,200	35	6,237,000
2.3	Land agent/legal costs (5% of land costs)	sum	1	361,000	361,000
2.4	Purchase of land for pipeline terminal at each end of the pipeline & intermediate station	Sum	3	200,000	600,000
2.5	Lease of land for pipe dump	Sum	1	15,000	15,000
				SUB TOTAL £	7,213,000
3	**BASIC CONSTRUCTION PIPELINE**				
3.1	Cross country (rural)	metre	56,200	400	22,480,000
3.2	Rolling hills	metre	42,100	500	21,050,000
3.3	Hills with some steep slopes	metre	41,100	750	30,825,000
3.4	Hills and valleys with steep slopes	metre	6,500	1,350	8,775,000
3.5	weight coated pipe across flood Plain	metre	32,200	340	10,948,000
3.6	Extra over for rock excavation and padding	metre	2,000	260	520,000
3.7	Extra over for sand padding (say 20% of route)	metre	35,640	37	1,318,680
				SUB TOTAL £	95,916,680
4	**CROSSINGS**				
4.1	Horizontal directional drill length	metre	100	2,000	225,000
4.2	Auger bore motorway	no.	1	50,000	50,000
4.4	Auger bore A road	no.	19	30,000	570,000
4.5	Auger bore B road	no.	15	24,000	360,000
4.6	Open cut minor road	no.	94	10,000	940,000
4.7	Auger bore railway	no.	4	20,000	80,000
4.8	Waterways (canal/major river)	no.	15	120,000	1,800,000
				SUB TOTAL £	4,025,000

No	ITEM	UNIT	QTY	RATE (£)	COST (£)
5	**OTHER**				
5.1	Cathodic protection (supply and install)	metre	178,200	3	534,600
5.2	New land drains (say 50% of route)	metre	89,250	25	2,231,250
5.3	Site investigations	metre	178,200	2	267,300
5.4	Special fencing (say 10% of route)	sum	17,800	6	106,800
5.5	Pipe dump/depot	sum	2	60,000	120,000
				SUB TOTAL £	3,259,950
6	**BLOCK VALVE STATION**				
6.1	Supply and install intermediate remote control valve station including civil works, piping/instrumentation, electrics and telemetry outstation	sum	2	250,000	500,000
				SUB TOTAL £	500,000
7	**TERMINAL STATIONS**				
7.1	Supply and install gas offtake facility along with Transco AGI including fencing, civil works valves and piping, temporary pigging facilities, pressure let down facilities, instrumentation, control, electrical and telemetry outstation, interconnection piping and cables to Transco minimum offtake.	sum	3	3,250,000	9,750,000
7.3	Central control and data acquisition centre	sum	3	200000	600,000
				SUB TOTAL £	10,350,000
				TOTAL CAPITAL COSTS	210,429,030
8	**PROJECT COSTS**				
8.1	Environmental assessment	sum	1	300,000	300,000
8.2	Project management and procurement 7% of capital cost	sum	1	14,730,032	14,730,032
8.3	Design and investigations 6% of capital cost	sum	1	12,625,742	12,625,742
8.4	Supervision and inspection 6% of capital cost	sum	1	12,625,742	12,625,742
				TOTAL PROJECT COSTS £	40,281,516

TOTAL COSTS		**TOTAL £**	250,710,545.7
	29.31053	**£'s per in per m**	

Appendix B: Pipeline Route Maps

Appendix C: Photographs